

## Dead fish and frogs associated with Cane Toads near Darwin

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### History

Cane Toads *Bufo marinus* first entered the Northern Territory from Queensland in 1980 (Lever 2001; van Dam *et al.* 2002). Since then they progressed westwards and were first recorded in the greater Darwin region in 2005 (Phillips *et al.* 2007). Little has been documented about the impacts of Cane Toads on the aquatic fauna of the Northern Territory.

The Cane Toad Hotline was alerted about the presence of many Cane Toad metamorphs around the edge of a small lagoon near Darwin (12°25'S 130°57 "E) on 24 March 2007. Members of Frogwatch NT visited the site on 26 March, and Fisheries staff visited on 27 March after receiving reports of dead fish.

The ephemeral shallow lagoon was connected to a permanent waterbody by floods resulting from heavy rains during early March 2007. Small numbers of adult Cane Toads had been in this waterbody for at least two years.

### Observations

Many thousands of Cane Toad tadpoles and toadlets were observed around the lagoon and associated waterbodies. Approximately 70 dead Spangled Perch *Leiopotherapon unicolor* (10-20 cm total length) were floating on the surface of the lagoon. No other dead fish were observed.

The dead fish were already severely decomposed when Fisheries staff visited the site on 27 March. Fourteen of the dead Spangled Perch were dissected but the fish and their guts were too decomposed for any stomach contents to be identified. However, on 26 March a dead Spangled Perch on the bank disgorged a tadpole when the fish was squeezed. This tadpole was positively identified as that of a Cane Toad (Figure 1).

Experienced Fisheries staff found no suggestion that the fish kills were related to low dissolved oxygen levels, which is the most common cause of fish kills in the Top End (Townsend 1994). Hundreds of active Black-banded Rainbowfish *Melanotaenia nigrans* were in the lagoon, but no dead Rainbowfish were observed. No sick or gulping fish

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were observed, which further suggests that water quality did not cause the fish kill. The landholders assured us that there had been no chemical spill or leakage.

On the short grass surrounding the water, 11 young Northern Waterfrogs *Litoria dablii* and two Marbled Frogs *Limnodynastes convexiniscus* were also found dead. Many Northern Waterfrogs were seen active in a nearby drain where numerous Cane Toad tadpoles, but no toadlets or dead frogs, were observed.



**Figure 1.** Dead Spangled Perch with a partially digested Cane Toad tadpole (encircled) that was disgorgeed when the fish was squeezed. (Graeme Sawyer)

## Discussion

Very little information has been published about interactions between Cane Toads and fish in the field. This paper is a step towards filling this knowledge gap.

### *Fish*

Spangled Perch are opportunistic predators - their diet is typically a diverse mix of animal material with little plant material (Pusey *et al.* 2004). They have been recorded dying in the laboratory after tasting Cane Toad tadpoles, even though these had been spat out immediately (Hearnden 1991). Other native fish known to die after ingesting Cane Toad tadpoles include Banded Grunters *Amniataba percoides* (Hearnden 1991), Fly-specked Hardyheads *Craterocephalus stercusmuscarum* (Crossland & Alford 1998), and Northern Trout Gudgeons *Mogurnda mogurnda* (Pearse 1980, in van Dam *et al.* 2002).

Black-banded Rainbowfish are generally small (6 cm or less total length; Allen *et al.* 2002), and have much smaller mouths than Spangled Perch of a similar size, meaning they would be unlikely to attempt to swallow tadpoles or toadlets. Western

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Rainbowfish *Melanotaenia australis* in aquaria did not consume offered Cane Toad tadpoles (Crossland & Alford 1998).

While many north Australian freshwater fish eat frogs and tadpoles, most fish appear to avoid Cane Toad tadpoles and eggs (Voris & Bacon 1966; Licht 1968; Lawler & Hero 1997). Other fish such as Barramundi *Lates calcarifer*, Sooty Grunter *Hepbaestus fuliginosus* and Mouth Almighty *Glossamia aprion* may take in tadpoles but spit them out almost immediately (Crossland 1997; R. Shine, unpubl.) with no obvious long term effects. Other fish have been observed spitting out toad eggs immediately after taking them into their mouths (Licht 1968). Northern Trout Gudgeons appear capable of rapidly learning to avoid attacking toad tadpoles (R. Shine, unpubl.). Conversely, a range of Northern Territory native freshwater fish including Glassfish (Family Ambassidae), Western Rainbowfish *Melanotaenia australis*, Fly-specked Hardyheads and Black Catfish *Neosilurus ater* that had never encountered Cane Toads all ate toad eggs in an aquarium and died, despite these fish being well fed (Wilson 2005).

Anecdotal reports also suggest that fish can die from Cane Toad toxins in the water. Wilson (2004) observed dead Sooty Grunter *Hepbaestus fuliginosus* immediately downstream of a dead Cane Toad in spring fed pools near Oenpelli, while Sooty Grunter in pools above the dead Cane Toad were still alive. Again water quality was unlikely to cause this fish kill. It is not known how common such incidents are.

### Frogs

Our observations suggest that some frogs such as Northern Waterfrogs and Marbled Frogs may be impacted by small Cane Toads. Interestingly, no dead frogs were seen in the nearby waterway that contained many Cane Toad tadpoles, suggesting that they did not eat the tadpoles.

Adult Northern Waterfrogs are largely aquatic and predatory during the wet season (Cogger 2000), and as such may eat the relatively slow moving toadlets. Van Dam *et al.* (2002) listed Northern Waterfrogs as possibly susceptible to Cane Toads because they are known to eat small frogs. Interestingly, Northern Waterfrogs have been observed eating small Cane Toads and their tadpoles and surviving, while on other occasions they have been found dead in the vicinity of Cane Toads (G. Sawyer, unpubl.). This is an area that warrants further research.

Little information is available on feeding behaviour of Marbled Frogs. Laboratory trials on the related *Limnodynastes ornatus* found that nine out of ten tadpoles offered Cane Toad eggs ate the eggs and died. The *L. ornatus* tadpoles did not eat Cane Toad tadpoles (Crossland & Alford 1998). van Dam *et al.* (2002) also listed Marbled Frogs as being possibly susceptible to eating Cane Toads and being poisoned.

### Do Cane Toads kill fish and frogs?

It appears that when large numbers of Cane Toad tadpoles or toadlets are present, some species of large-mouthed opportunistic predatory fish such as Spangled Perch

may eat these and die. Some frogs such as Northern Waterfrogs and Marbled Frogs may also be affected. It is, however, generally difficult to prove that an animal has died as a result of eating Cane Toads (Covacevich & Archer 1975). Several factors add weight to this theory; one Spangled Perch was found dead with a Cane Toad in its mouth, fish that are unlikely to attempt to swallow Cane Toad tadpoles or toadlets were unaffected, and fish did not die from low dissolved oxygen, the most common cause of fish kills in the Top End.

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